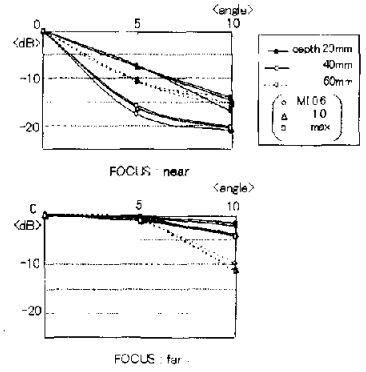
steadily high even deviating away from the ultrasound beam, resulting excessive destruction of microbubbles. The focus point should be set near, when opacification of the near region is examined.



1021-57 Microvascular Behavior of Microbubbles Is Strongly Influenced by Shell Charge and Polyethyleneglycol Coat

Nicholas G. Fisher, Jonathan P. Christiansen, Alexander L. Klibanov, Howard Leong-Poi, Sanjiv Kaul, Jonathan R. Lindner, *University of Virginia, Charlottesville, Virginia.*

Background: Ultrasound imaging has demonstrated that certain experimental microbubble agents are retained within normal tissue irrespective of size. Since these microbubbles contain negatively charged lipids, we hypothesized that anionic microbubbles are retained by attachment to vascular endothelium especially when a protective polyethylene glycol (PEG) coat is absent.

Methods: Lipid microbubbles of similar size with either a net neutral or anionic charge were prepared, with or without PEG-40 stearate. The microvascular behavior of the microbubbles was assessed by intravital microscopy of the cremaster muscle in 9 mice. Twenty optical fields (0.2 mm^3 tissue per OF) were observed at 2 and 10 min following intravenous injection of $4x10^7$ fluorescently-labeled bubbles. Pulmonary and myocardial retention of microbubbles was assessed by low-MI myocardial contrast echocardiography in 6 dogs following bolus intravenous injections of microbubbles.

Results: Neutral microbubbles with or without PEG were rarely retained within the cremasteric microcirculation. Anionic microbubbles (zeta potential -75 mV) without PEG adhered to the endothelial surface of capillaries for several seconds to >10 min. The mean number retained decreased with time (4.3±0.3 versus 2.0±0.9 mm^{-3} at 2 and 10 min, p<0.01). The presence of surface PEG significantly (p<0.01) reduced anionic microbubble retention (1.4±0.1 mm^{-3} and 0.9 ±0.1 mm^{-3} at 2 and 10 min). Myocardial retention of anionic microbubbles without PEG was confirmed by persistent myocardial opacification 10 min after injection. Pulmonary capillary retention was greater for anionic microbubbles without PEG compared to neutral microbubbles with PEG, as determined by the percent signal loss from the RV to LV cavity, (66±14 versus 35±16 %, signal loss p<0.01).

Conclusions: The surface charge and presence of PEG influence the microvascular behaviour of lipid microbubbles. Anionic microbubbles without PEG are retained in capillaries thereby increasing their pulmonary retention. However, capillary retention may be advantageous for delayed myocardial imaging.

1021-58 Skin Perfusion Assessed by Contrast Ultrasound Predicts Tissue Survival In a Free Flap Model

Jonathan P. Christiansen, Howard Leong-Poi, Lester R. Amiss, David B. Drake, Sanjiv Kaul, Jonathan R. Lindner, *University of Virginia, Charlottesville, Virginia.*

Background. Successful autologous skin flap grafting, widely used to correct traumatic and other wound defects, depends on adequate perfusion in the transposed tissue. Post-operative venous occlusion is a common cause of flap failure in patients. Currently a reliable, non-invasive means for assessing perfusion in soft tissue flaps that can accurately predict survival is not available . We hypothesized that contrast ultrasound could assess skin perfusion and would predict long-term flap survival following post-operative venous occlusion.

Methods. Autologous abdominal skin flaps, with a left epigastric vascular pedicle, were created in 10 rats. Venous occlusion (5 hrs) was performed on Day 2. Perfusion in the flap and adjacent normal skin was assessed using real-time pulse inversion imaging (MI = 0.1) during intravenous infusion of Optison, prior to occlusion and 24 hr after reflow. Quantitative measurements of capillary blood volume (CBV) in the flap were expressed as a ratio to that in the normal skin. Flap perfusion was also qualitatively assessed by a blinded observer and scored as normal, reduced, or absent. Flap survival was assessed on Day 7.

Results. Following surgery perfusion assessment was possible in all flaps and hyperemia was seen prior to venous occlusion (CBV ratio 1.5±0.26). At Day 7, 4 flaps survived and 6 were necrotic. Proximal flap perfusion 24hrs after venous occlusion was significantly greater in flaps that survived vs those that became necrotic (CBV ratio 0.8±0.09 vs 0.2±0.1, p=0.0001). Qualitative assessment of the presence of perfusion (either normal or reduced) by the blinded observer correlated well with quantitative data, and predicted flap outcome in all cases.

Conclusions. Skin perfusion may be assessed quantitatively and qualitatively by contrast ultrasound. Perfusion 24hrs following a secondary ischemic insult in a free flap accurately predicts subsequent tissue survival. These findings have important implications for the bedside assessment of skin flap viability and for determining treatment strategies.

POSTER SESSION

1022 Advances in Prognostic Assessment With Nuclear Imaging

Sunday, March 17, 2002, 9:00 a.m.-11:00 a.m.
Georgia World Congress Center, Hall G
Presentation Hour: 10:00 a.m.-11:00 a.m.

1022-59 Prognostic Value of Stress Myocardial Perfusion SPECT In Patients With Markedly Reduced Left Ventricular Function

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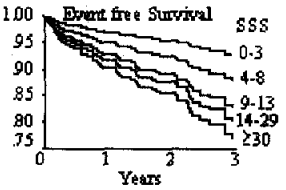
Background: The role of stress myocardial perfusion in predicting cardiac events in patients with markedly reduced left ventricular (LV) function is controversial.
Methods: We identified 599 patients who underwent rest Tl-201/stress Tc-99m sestamibi gated SPECT (treadmill exercise or adenosine), and had LV ejection fraction (EF)<35% by gated SPECT. Patients were followed up for 2.1+/-0.7 yrs. Follow-up time was censored at the occurrence of cardiac death, myocardial infarction (MI) or revascularization. Perfusion images were scored using a 20-segment model and a 0-4 scale, and summed stress (SSS) and rest (SRS) scores were derived.
Results: During follow-up 58 cardiac deaths and 14 non-fatal MIs occurred. Multivariate Cox regression demonstrated that SSS was a significant predictor of cardiac events, after adjusting for clinical and EF data (p=0.02), whereas SRS was insignificant (p=0.1). Adjusted 3-year survival rates without MI were 93% for SSS 0-3, 88% for 4-8, 84% for 9-13, 80% for 14-29, and 77% for SSS>/=30 (Figure). The number of segments with reversible perfusion defect and the number of those with non-reversible defect were both independent predictors of cardiac events (p=0.02 and 0.01, respectively).
Conclusion: The overall amount of perfusion abnormality at stress and the extent of stress induced ischemia are independent predictors of outcome in patients with EF<35%. Thus, stress myocardial perfusion provides significant prognostic information in patients with markedly reduced EF.



1022-60 Comparison of Post-Stress 99mTc-Sestamibi Lung Uptake and Transient Ventricular Dilation in Severe Ischemia

Claudio Marcassa, Michele Galli, Riccardo Campini, Paolo Calza, Pantaleo Giannuzzi, *Salvatore Maugeri Foundation, IRCCS, Veruno, Italy.*

Background. Transient ischemic dilation (TID) and high lung/heart ratio (L/H) in thallium-201 scintigraphy are related to the severity of ischemia. How accurate are these parameters in stress sestamibi SPECT is still controversial.
Methods. The TID index and L/H were calculated in 360 consecutive pts (63±9 years; 53% male) with known or suspected CAD (22% with old MI), undergoing dual-day stress (187 pts exercise and 173 dipyridamole) - rest sestamibi Gated-SPECT imaging. L/H was calculated from a summed anterior projection on post-stress images, acquired 40-45 min after the injection; the perfusion defect size was calculated from polar maps of tracer distribution by comparison with our normal data-base (mean - 2SD). A (stress - rest) tracer uptake defect >5% defined the presence of stress-induced ischemia. Post-stress and rest LV EF was automatically calculated using the QGS method; a TID index was also calculated. Severe ischemia was defined as the presence of either a reversible defect>15% of LV surface or a decrease in LVEF from rest to stress >5%, or both.
Results. Severe ischemia was documented in 48 pts (13%; 25 with a reversible defect>15%, 14 with a LVEF decrease >5% and 9 with both) . L/H was 0.36±0.06 and 0.29±0.05 in pts with or withouth severe ischemia, respectively (p<0.0001). TID index was 1.08±0.22 and 1.37±0.45, respectively, in pts with or without severe ischemia (p<0.001).
By ROC analysis, L/H better correlated with the occurrence of severe ischemia (area-under-curve 0.81 [CI 0.76-0.92]; sensitivity 79%, specificity 89%) than TID index (area-under-curve 0.72 [CI 0.61-0.81], sensitivity 59%, specificity 83%; p<0.05). The best cut-off values of L/H and TID index for the detection of severe ischemia were 0.32 and 1.19, respectively.
Conclusions. Elevated (>0.32) L/H on post-stress sestamibi SPECT seems to yield an accuracy in the detection of patients with severe ischemia better than that provided by TID. Differences between lung tracer kinetic and in LV volumes recovery after stress could explain these results.